XML Conceptual Review

Modules Roadmap: You Are Here

- Anatomy of an XML Exchange
- XML Conceptual Review
- Basic XML Schema for NIEM
- Advanced XML Schema for NIEM
- Substitution Groups
- Extension Schemas

Objectives Roadmap

This module supports the following course objectives:

Define the physical components of an XML exchange.

Identify basic XML components that are used in the NIEM structure.

Write and/or extend an XML schema conformant to the NIEM Naming and Design Rules (NDR).

Module Objectives

- In this module, we will review how to:
  - Compare and contrast XML elements and attributes.
  - Describe the characteristics of a well-formed instance.
  - Create an XML instance based on the given XML schema.

What do XML tags (elements) do?

- The information in an XML document is contained within the various tags that constitute the markup of the document.
  - Makes it easy to distinguish the information from the markup.
  - Make it possible for incompatible computers, operating systems, & applications to share information.
  - Allow XML to become a universal translator between systems.

Naming Rules For XML Elements

- Can contain letters, numbers, and other characters.
- Must not start with number or punctuation.
- Must not start with **xml**, **XML**, or **Xml**.
- Cannot contain spaces.

Valid/Invalid Element Names

Valid

- <Person_Name>
- <Person123>
- <Person-Name>
- <Person.Name>

Invalid

- <Person_Name&>
- <123Person_Name>
- <Person Name>
- < Person_Name>
- <Person;Name>

Other Element Naming Considerations

- Make names descriptive.
- Avoid [–] and [.] and [:] in names (dash, period, and colon).
  - Usually reserved for namespaces.
  - Allowed, but not a general best practice.
- Can be as long as you like.
  - Should be descriptive and be consistently used.
- Non-English letters like “é ò á” are legal.
  - Watch out for problems… may not be supported.

Root, Parent, and Child Elements

- First element in an XML document is called a root element
- Person is the name of the element
- Also the Parent element of "PersonName"

- Parent element of "PersonGivenName" and "PersonSurName"
- Child element of "Person"

```
<Person>
  <PersonName>
    <PersonGivenName>
      Marge
    </PersonGivenName>
    <PersonSurName>
      Simpson
    </PersonSurName>
  </PersonName>
</Person>
```

XML Comments

- Examples

```
<Person>
    <!-- This is a valid comment -->
    <PersonName>
        <PersonSurName>Simpson</PersonSurName>
        <PersonGivenName>Homer</PersonGivenName>
    </PersonName>
    <!-- This is also
         a valid comment -->
    <Employment>
        <EmployerName>Springfield Nuclear</EmployerName>
    </Employment>
</Person>
```

Processing Instructions

- Generally speaking, used to encode application-specific data.
  - Most popular usage to associate presentation or transformation files with the data.
- Starts with "**<?**"
- Ends with "**?>**"
- Examples:

```
<?xml-stylesheet href="mystyle.css" type="text/css"?>

<?perl lower-to-upper-case?>
```

Prolog

- A special processing instruction included at the beginning of an XML instance.
  - Specifies version & character encoding
- Example:

```
<?xml version="1.0" encoding="UTF-8"?>
<Person>
    <PersonName>
        <PersonSurName>Flanders</PersonSurName>
        <PersonGivenName>Ned</PersonGivenName>
    </PersonName>
</Person>
```

XML Attributes

- Part of an element that provides additional information about that element.
  - Defined as a name/value pair (Single Property for an Element).

```
<?xml version="1.0" encoding="UTF-8"?>
<Person>
    <PersonName nameCode="RealName">
        <PersonSurName>Flanders</PersonSurName>
        <PersonGivenName>Ned</PersonGivenName>
    </PersonName>
</Person>
```

Quotation Marks in Attributes

- Values must always be enclosed in quotes.
  - Either ‘single’ or “double” quotes can be used.
  - Double quotes most common
  - If value contains single quotes, it is necessary to use double quotes.

Attributes Quoting Examples

```
<Person>
   <PersonName>
     <PersonSurName>Simpson</PersonSurName>
     <PersonGivenName>Homer</PersonGivenName>
   </PersonName>
   <SourceList name="Moe's Tavern Bowling Team"/>
</Person>
```

Attribute Usage

- No concrete rule to differentiate attribute usage from element usage.
- Ultimately, it is a subjective decision
  - If it seems like data, it is an element.
  - If it seems like a description of data, it is an attribute.
- **The deciding factor might be that you do not put "content" in an attribute.**

Element vs. Attribute

- An element can be any data type
- An attribute is just a string.
- An element can have other elements or attributes nested inside of it.
- An attribute ***cannot*** have an element or attribute nested inside of it.

Exercise 2.1: Attribute or Element?

- Are the following items **Attributes** or **Elements**, and why?
  - Name
  - Measurement Units
  - Age
  - Reliability
  - Accuracy

Solution 2.1: Attribute or Element?

- Name (Element)
  - How name is represented can vary significantly. It can be a simple name or a structured name.
- Measurement Units (Attribute)
  - Generally it is a quantifier. E.g., speed would use an attribute such as this to designate MPH (Miles per Hour, Foot-Pounds, Newton Meters, etc.)
- Age (Element)
  - Besides potentially needing to be extended to represent a range instead of a discrete age, qualifying the age would be easily done with something like a measurements attribute from above. E.g., Years, Days, Months.
- Reliability (Attribute)
  - It will typically qualify something else, like a statement of fact.
- Accuracy (Attribute)
  - It will typically qualify something else, like a measurement of something. E.g., 20 MPH +/- 5.

Well-formed XML *(1 of 2)*

- An XML instance (document containing XML tags and content) with correct syntax as defined by the XML standard is referred to as being "well-formed."
- "Well-formed" refers only to the ***structure*** and ***syntax*** of the XML.

Well-formed XML *(2 of 2)*

- A "well-formed" XML document instance has correct XML syntax.
- It is a document that conforms to the XML syntax rules.
- A well-formed document is one that meets the minimum criteria for XML parsers to read the document.

Rules for Well-formed XML *(1 of 2)*

- XML declaration (Prolog) must come first in every document.
- Comments are not valid within a tag.
- Comments may not contain two hyphens in a row other than the beginning and end of the comment.
- Tags must have an end tag, or be closed within the singleton tag itself, for example **<PersonAge/>**

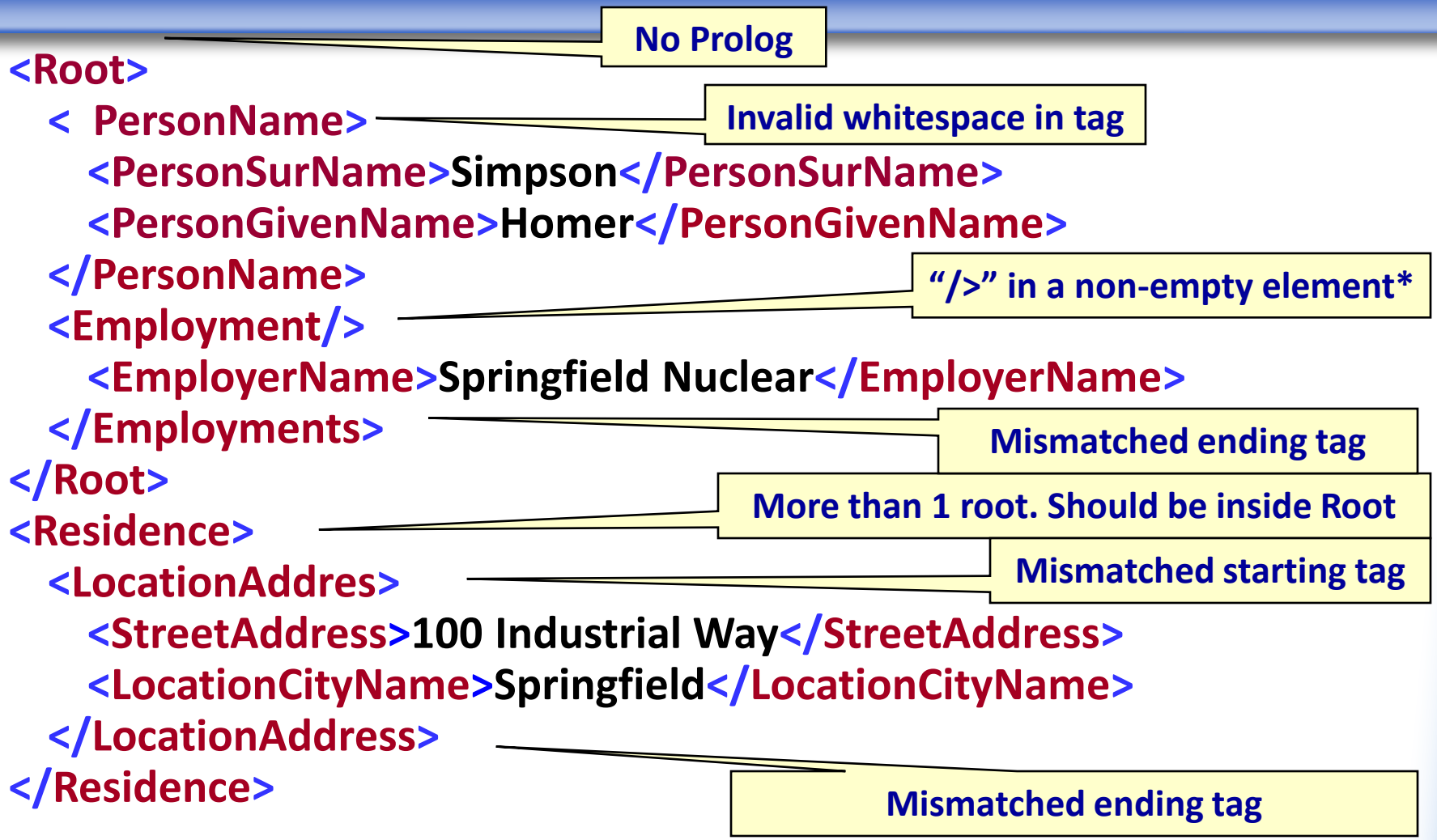
Rules for Well-formed XML *(2 of 2)*

- All attributes of tags must be quoted.
  - Preferably double quotes, unless attribute contains a double quote (then use single quotes).
- Every XML document must contain one root element that completely contains all the other elements.
- Tags cannot overlap – must nest correctly.

Exercise 2.2: Find the Errors

```
<Root>
  <  PersonName>
    <PersonSurName>Simpson</PersonSurName>
    <PersonGivenName>Homer</PersonGivenName>
  </PersonName>
  <Employment/>
    <EmployerName>Springfield Nuclear</EmployerName>
  </Employments>
</Root>
<Residence>
  <LocationAddres>
    <StreetAddress>100 Industrial Way</StreetAddress>
    <LocationCityName>Springfield</LocationCityName>
  </LocationAddress>
</Residence>
```

Solution 2.2: Find the Errors



What is an XML Instance?

- When you use the rules of an XML schema to create content, the result is an XML document instance.
- The schema controls what the instance looks like and what is in it.
  - i.e., it is the blueprint for what an XML instance can look like.

PersonName Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetnamespace="http://myNamespace.com"
      xmlns:xs="http://www.w3.org/2001/XMLSchema">
    <xs:complexType name="PersonNameType" >
      <xs:sequence>
        <xs:element name="PersonNamePrefix" type="xs:string" minOccurs="0"/>
        <xs:element name="PersonGivenName" type="xs:string" minOccurs="0"/>
        <xs:element name="PersonMiddleName" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="PersonSurName" type="xs:string"/>
        <xs:element name="PersonSuffixName" type="xs:string" minOccurs="0"/>
      </xs:sequence>
      <xs:attribute name="PersonNameCode" use="optional" default="RealName">
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="RealName"/>
            <xs:enumeration value="Alias"/>
            <xs:enumeration value="BirthName"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>
    </xs:complexType>
    <xs:element name="PersonName" type="PersonNameType"/>
</xs:schema>
```

Resulting Example Instance

```
<?xml version="1.0" encoding="UTF-8"?>
<PersonName PersonNameCode="RealName">
   <PersonNamePrefix>Mr</PersonNamePrefix>
   <PersonGivenName>Juan</PersonGivenName>
   <PersonMiddleName>Anna</PersonMiddleName>
   <PersonSurName>Tu</PersonSurName>
   <PersonSuffixName>Sr</PersonSuffixName>
</PersonName>
```

Exercise 2.3: Instance

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
    xmlns:local-ns="http://myNamespace.com"
    xmlns:xs="http://www.w3.org/2001/XMLSchema">
    <xs:element name="Location">
      <xs:complexType>
        <xs:sequence>
            <xs:element name="LocationName" type="xs:string" minOccurs="0"/>
          <xs:element name="LocationAddress">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="AddressFullText" type="xs:string" minOccurs="0"/>
                <xs:element name="LocationCityName" type="xs:string" minOccurs="0"/>
                <xs:element name="LocationStateName" type="xs:string"/>
                <xs:element name="PostalCodeText" type="xs:string" minOccurs="0"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
</xs:schema>
```

Solution 2.3: Instance

```
<?xml version="1.0" encoding="UTF-8"?>
<Location
   xmlns:my="http://myNamespace.com"
   xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
   xsi:schemaLocation="Path to schema" >

   <LocationName>Charville Farmhouse</LocationName>
   <LocationAddress>
      <AddressFullText>421 Bath Rd</AddressFullText>
      <LocationCityName>Charville</LocationCityName>
      <LocationStateName>Utah</LocationStateName>
      <PostalCodeText>83405</PostalCodeText>
   </LocationAddress>
</Location>
```

Module Summary

- In this module, we reviewed how to:
  - Compare and contrast XML elements and attributes.
  - Describe the characteristics of a well-formed instance.
  - Create an XML instance based on the given XML schema.

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